DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date December 15, 1994

From Chief, SPS, RPB, DHAC

Subject Health Consultation: Vacant Lot, Lake County, North Chicago, Illinois

To Louise Fabinski, Senior Representative, Region V

Attached is the health consultation for the Vacant Lot site prepared by the Illinois Department of Public Health under cooperative agreement with the Agency for Toxics Substances and Disease Registry (ATSDR).

As indicated on the certification page, ATSDR has reviewed the consultation and concurs with their findings.

If you have any questions or comments, please call me at 404-639-0628.

Rick

Richard E. Gillig

Attachment

cc:
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HEALTH CONSULTATION

Vacant Lot

Lake County, North Chicago, Illinois

CERCLIS NO. ILD984775437

December 15, 1994

Prepared by

Illinois Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

BACKGROUND AND STATEMENT OF ISSUES

The U.S. Environmental Protection Agency (USEPA) and the Agency for Toxic Substances and Disease Registry (ATSDR) have requested that the Illinois Department of Public Health (IDPH) review the historical and environmental data available and determine if a public health threat exists at this site [1]. The Vacant Lot site (hereafter referred to as "the site") is located at the northeast corner of Commonwealth and Martin Luther King Jr. Drive, North Chicago, Lake County, Illinois. The approximate 1.8 acre site is surrounded by industrial, commercial, and residential properties. To the north, it is bordered by the Elgin, Joliet and Eastern Railroad with residences beyond, to the east by Fansteel Inc., to the south by a parking area, and to the west by Commonwealth Street and Emco Chemical Distributors (Attachment 1).

The site is generally flat with a slight slope toward Pettibone Creek that flows through the site from north to south. This creek drains into Lake Michigan approximately 1 mile downstream from the site. A slag material exists on the ground surface throughout the site and extends to a depth of 3 feet in some areas. The site is not well vegetated; there are areas that are sparsely covered with grass and moss. Access to the site is not restricted in any way. People reportedly use this site as a throughway since it is located in an area of businesses and nearby residences. There is evidence (trash) that the site is being used by nearby residents to visit the creek area. A local authority has also stated that the site is sometimes inhabited by homeless people [2]. Blankets have been observed in large diameter concrete pipes on the west side of the creek.

The site has changed owners several times since the turn of the century. A 1907 plat map indicates that the property that now comprises the site and adjacent land to the east (Fansteel) was owned by an individual. A 1921 map shows that most of the land now occupied by the vacant lot, Fansteel, and North Chicago Refiners & Smelters was owned by Vulcan-Louisville Smelting Company. The property was transferred to C.N.S. & M. Railroad Company in 1936. Sometime between 1936 and 1954 the vacant lot property was sold to an individual who developed the property as a parking lot. The owner solicited for fill material to be brought to the lot. Currently, the title to the property is held by Northern Trust Bank in Lake Forest, Illinois as the trustee for John Stack [3].

Conversations with local authorities and local residents have revealed that the site was used by local industries for waste disposal or waste storage. The majority of this waste consisted of tailings and foundry sand. As stated earlier, cinder/slag type material exists throughout the site at the ground surface and extends to a depth of approximately 3 feet. Pavement is located below this material in some areas of the site. A small pile of the cinder/slag material is located east of the creek on the northern portion of the site [3].

In 1988, a fire occurred at the site. The North Chicago Fire Department responded to the fire and determined that fill material at the site had become heated, igniting nearby brush. The fire area extended approximately 200 feet along a ravine. The ravine fill material,

extending to an approximate 10 foot depth, also burned. Personnel from the Illinois Environmental Protection Agency's (IEPA) Emergency Response Unit visited the site on June 15, 1988 to collect soil samples. Three soil samples were collected and analyzed for metals. Analyses of these samples revealed elevated concentrations of lead (43,500 parts per million [ppm]), barium (3,500 ppm), and cadmium (350 ppm). The site was added to the CERCLIS list on August 1989 as the result of the fire at the site [3].

The site received its initial CERCLA evaluation in September 1990. This evaluation was in the form of a CERCLA Preliminary Assessment (PA) conducted by IEPA. In April 1993, IEPA submitted a sampling work plan for a CERCLA Integrated Assessment of the Vacant Lot site to U.S. EPA Region V. Sampling was conducted in May 1993 by IEPA. A total of 11 soil samples, 5 sediment samples, and 4 groundwater samples were collected. An additional sediment sample was collected in April 1994 [3].

Five soil samples were collected on-site and five residential soil samples were collected off-site (Attachment 2). One background sample (X101) was collected from the ballfield at the Neal Elementary School located approximately 1/2 mile east of the site (Attachment 3). The samples were collected to characterize the waste on-site and to determine the extent of contamination. The on-site samples were determined to be waste samples instead of soil samples, because they were collected from areas containing the cinder/slag material. Five soil samples were collected from residential yards to determine if site related contaminants have been transported off-site. Since the depths of the waste/soil samples ranged from one to four inches, they will be considered surface samples. Three sediment samples were collected from Pettibone Creek on-site and one sediment sample was collected at the point where the creek originates (just a few feet upstream of the site). Since the origin of the creek was near the site, an adequate upstream background sample could not be obtained. For this reason, it was necessary to collect a background sample from a downstream location. The location selected was in an area where the creek flows through the Great Lakes Naval Training Center, since this area is not thought to be affected by the site. An additional sediment sample was collected from the inner harbor of Lake Michigan in April 1994 to determine if contaminants were present in the lake. The groundwater samples were collected from three monitoring wells located on site (Attachment 4). These monitoring wells were installed in 1989. One of the groundwater samples collected was a duplicate sample.

A number of compounds were detected in the samples collected on-site and off-site. Laboratory analyses of the soil/waste samples collected on-site revealed the presence of the following compounds: volatile and semi-volatile compounds, pesticides, polychlorinated biphenyls (PCBs), and organic compounds. Residential (off-site samples) contained semi-volatile compounds, pesticides, PCBs, and inorganic compounds. Sediment samples collected from Pettibone Creek and the Lake Michigan harbor contained volatile and semi-volatile organic compounds, pesticides, PCBs, and inorganic compounds. Laboratory analyses of the groundwater samples detected volatile organic compounds, pesticides, PCBs, and inorganic compounds.

The results of the waste/soil samples indicate that the following compounds were detected in excess of USEPA removal action levels: arsenic (X102-X105, X107, X108, X111, X112), beryllium (X102, X104, X105), cadmium (X102), chromium (X102), copper (X102, X104, X105, X107), and lead (X102-X105, X107-X111) [3]. Figure 2 (Attachment 2) illustrates the on-site sample locations and Figure 3 (Attachment 3) illustrates the off-site sample locations.

Table 1 summarizes the contaminants detected in the soil/waste, sediment, and groundwater samples (but does not include the three soil samples from the 1988 site fire area). The maximum concentration detected is included for each environmental medium.

DISCUSSION

The sample results indicate that the contamination detected on-site seems to be attributable to past disposal of tailings and foundry sand. The major concern at the site is direct exposure to on-site soils/waste since access to the site is not restricted in any way. Exposure is known to occur since the site is used as a throughway to residences and businesses in the area. In addition, it has been documented that the site is inhabited by homeless people from time to time. The compounds of concern in on-site soil/waste material include volatile compounds (1,2-dichloroethene, trichloroethene), polycyclic aromatic hydrocarbons (PAHs), PCBs, arsenic, beryllium, lead and manganese. Exposure may be occurring through incidental ingestion, dermal contact, and inhalation of dust entrained particles. These exposures may occur during play activities or direct contact with the soils.

The results of the sediment samples also indicate that contamination is present on-site in sediments from Pettibone Creek. Contaminants of concern detected in the sediments from Pettibone Creek include vinyl chloride, 1,2-dichloroethene, acetone, 1,1,1-trichloroethane, trichloroethene, PAHs (including benzo(a)pyrene), dieldrin, aldrin, PCBs, and lead. Again, since access to the site is not restricted in any way, exposures are possible if children play in this creek. The primary route of exposure is direct dermal contact to sediments. The creek reportedly has a constant flow and flows into the Great Lakes Naval Training Center and Lake Michigan. The total length of the creek from its point of origin to Lake Michigan is approximately 1.2 miles. Fish and frogs are present in Pettibone Creek representing another possible route of exposure, ingestion. People using Lake Michigan for recreational purposes or as a drinking water source may also be exposed if contaminants from the site are reaching the lake. Information from the IEPA Bureau of Public Water Supplies and from local water operators indicates that 10 communities have intakes located within 15-miles of the discharge [3]. No surface water samples have been collected on-site or off-site.

The contaminants detected in on-site groundwater include acetone, aldrin, boron, cadmium, chlordane, 1,1-dichloroethene, 1,2-dichloroethene, 4,4-DDT, endrin, manganese, PCBs, trichloroethene, vinyl chloride, and zinc. All of these compounds were also detected in other on-site samples, with the exceptions of 1,1-dichloroethene and vinyl chloride. All of these

compounds exceeded levels that are acceptable for drinking water. Groundwater may be a significant pathway for residents in the area that utilize groundwater for drinking and household uses. According to the IEPA Division of Public Water Supplies and well data obtained from the Illinois State Water Survey, the wells within 4 miles that utilize groundwater from the aquifer include two public water supply wells (one within 1 to 2 miles and one within 2 to 3 miles); three non-community public wells (all within 2 to 3 miles); and approximately 215 private wells [3]. The nearest well known to utilize the groundwater is a private well located approximately 1.5 miles southeast of the site. It is estimated that approximately 5,100 people utilize groundwater within 4 miles of the site. The contaminants of primary concern in the groundwater are the volatile compounds, vinyl chloride, trichloroethene, 1,1-dichloroethene, and 1,2-dichloroethene. USEPA classifies vinyl chloride as a known human carcinogen, trichloroethene as a probable human carcinogen, and 1,2-dichloroethene as a possible human carcinogen. These compounds are very soluble in groundwater and are mobile. Groundwater is a major concern at this site since a number of contaminants have been detected and private and public water wells are located in the area. If contaminants migrate to these wells, people may be exposed by ingesting the water, inhaling volatilized products during household uses of the water, and by direct dermal contact during bathing or showering.

Volatile compounds were detected in two soil/waste samples on-site. It is surprising to find these compounds in such shallow samples (>3 inches). The compounds detected in these samples were also detected in the groundwater samples. Exposure to these compounds can cause headaches, dizziness, rashes, and fatigue [9,10]. These symptoms are usually only present when the level of the compound is sufficient to cause an odor. Of the volatile compounds of concern, USEPA lists vinyl chloride as a known human carcinogen, trichloroethene as a probable human carcinogen, and 1,2-dichloroethene as a possible human carcinogen. Exposures may be significant if drinking water wells in the area become contaminated with these compounds. Residents may be exposed by ingesting contaminated water, dermal contact with contaminated water, or by inhaling volatilized compounds during household water use. Additional sampling needs to be performed to better characterize exposures.

PAHs were detected at elevated concentrations in on-site soil/waste samples and residential yards. PAHs are a group of compounds that are formed during the incomplete burning of coal, oil, gas, garbage, or other organic substances. Several PAHs including benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene have demonstrated the capacity to cause cancer in animals [9]. PAHs are not stored in the body for long periods of time; most PAHs that enter the body are excreted within a few days through urine and feces. PAHs can cause harmful effects to the skin, body fluids, and the body's system for fighting disease after both short and long term exposures. PAHs are present naturally in the environment and everyday activities, such as cooking, produce some exposure on a daily basis. The main route of exposure to PAHs at the site and in residential yards is direct skin contact.

PCBs are a group of man-made organic chemicals that contain 209 individual compounds (known as congeners) with varying harmful effects. These compounds have no smell or taste and exist as either oily liquids or solids. Manufacturing of PCBs was ceased in 1977 due to evidence that PCBs build up in the environment and cause harmful effects. Health effects that may result from exposures to PCBs include skin irritations (rashes and acne) and irritation to the nose and lungs. Animal studies have documented effects to the skin, liver, immune system, nervous system, reproductive system, and cancer [8]. The USEPA considers PCBs possible human carcinogens and has established a Maximum Contaminant Level (MCL) of 0.5 parts per billion (ppb) for drinking water. Even though PCBs were detected above background levels in on-site soil/waste samples and residential soil samples, significant exposures are not expected based on the concentrations reported.

Arsenic is a naturally occurring element in the environment. It is strongly associated with lung and skin cancers in humans, and may cause other internal cancers as well [4]. Skin lesions and peripheral neuropathy are possible effects of chronic arsenic ingestion. Arsenic is not absorbed by the skin very well. Exposure to arsenic at the site is expected to be minimal for this reason. Children under six years of age may have significant exposures through ingestion, if they have frequent hand to mouth activities.

Beryllium is a hard grayish material that does not occur naturally. The element does occur as a chemical component of certain rocks, coal and oil, soil and volcanic dust. This material is used to make electrical and electronic parts or as construction materials for machinery and molds for plastics. Beryllium is present in small amounts in some foods and in tobacco products. It is not very well absorbed through the skin. There are very few health effects associated with beryllium exposures [5]. Some people can become sensitive to the element and develop an immune or inflammatory reaction called granulomas. This condition is known as chronic beryllium disease. Symptoms of this disease include fatigue and respiratory irritation. Significant exposures would not be expected at this site since beryllium is poorly absorbed by the skin. Children that exhibit frequent hand to mouth activities may be exposed.

Lead is a naturally occurring substance found in small amounts in the earth's crust. It is most harmful to children under 6 years of age because their body systems are rapidly developing. Exposure is greater in children due to their tendencies of frequent hand to mouth contact. Lead can adversely affect several major body systems if absorbed by the body. The most serious effect is neurological impairment. In children, prenatal exposure, as well as postnatal blood lead levels of 10 to 15 micrograms per deciliter, have been associated with numerous disabilities, including cognitive deficit (decreased IQ), decreased growth, reduced birth weight, and reduced hearing [6]. The Centers for Disease Control (CDC) has recommended an action level of 10 micrograms of lead per deciliter of blood for children. In adults, lead exposure may decrease reaction time and possibly memory loss and may also cause weakness in fingers, wrists, and ankles. At high levels of exposure, lead can severely damage the brain and kidneys in adults and children. Adults would not be expected to receive significant exposures at this site since lead is not absorbed through the skin. Adult exposures to lead

are usually limited to inhaling lead dust. No safe level of ingested lead has been identified. Ingestion of lead may be a significant route of exposure for children at this site since elevated concentrations (> 1,000 ppm) have been detected on and off-site. Children may be exposed during play activities.

Manganese is a naturally occurring substance found in many types of rock. Manganese is poorly absorbed through the skin. Because manganese is a regular part of the body, the body normally controls the amount that is taken up and stored. Ingestion of small amounts of this substance daily is important in maintaining health. The amount of manganese that is ingested in a normal diet ranges from 2,000-9,000 micrograms per day [7]. Ingesting large amounts of manganese can cause symptoms such as weakness, stiff muscles, and trembling hands. Ingestion of very high levels can cause changes in the brain. Exposures to manganese may be occurring on-site if children are playing in the soil. Again the main route of exposure would be through ingestion by frequent hand to mouth activities.

CONCLUSIONS

Based on the information reviewed, IDPH concludes that:

1. A potential health threat to humans does exist in association with the contaminants detected in on- and off-site soils and groundwater at the Vacant Lot site.

2. The contaminants detected in on-site soils are a particular concern for children who play on the site. Contaminants detected in off-site (residential) soils are also a concern for children during play activities.

3. Groundwater contamination may be a concern if contaminants migrate off-site to private and public wells in the area. A large population in the site area (within 4 miles) utilizes groundwater for drinking and household use.

4. The Vacant Lot will continue to be a potential health threat to trespassers until site access is restricted. Contaminants may also continue to migrate off-site via surface water, groundwater, and air (dust entrained contaminants) in the absence of remedial actions.

RECOMMENDATIONS

IDPH recommends:

1. preventing public access to the site.

2. performing additional groundwater sampling to determine if contaminants are migrating off-site and to determine the groundwater flow rates and direction.

3. performing additional soil sampling on- and off-site to better characterize the extent of contamination.

4. performing additional surface water and sediment sampling from Pettibone Creek to determine the extent of contaminant migration off-site.

5. performing additional soil sampling in the fire area to determine if significant levels of dioxins and furans were generated from the fire.

C. Michael Moomey

REFERENCES:

1. Memorandum: From Cindy Nolan (USEPA) to Louise Fabinski (ATSDR), October 1994.

2. Memorandum: From Judy Triller (IEPA) to Donald Bruce (USEPA), September 1994.

3. CERCLA Integrated Site Assessment, Vacant Lot (ILD 9847775437). Illinois Environmental Protection Agency, Springfield, Illinois. 1993.

4. ATSDR Draft Update Toxicological Profile for Arsenic. ATSDR, April 1993.

5. ATSDR Draft Update Toxicological Profile for Beryllium. ATSDR, April 1993.

6. ATSDR Draft Update Toxicological Profile for Lead. ATSDR, April 1993.

7. ATSDR Draft Update Toxicological Profile for Manganese. ATSDR, July 1992.

8. ATSDR Draft Update Toxicological Profile for Selected PCBs. ATSDR, April 1993.

9. ATSDR Draft Update Toxicological Profile for Polycyclic Aromatic Hydrocarbons. ATSDR, February 1990.

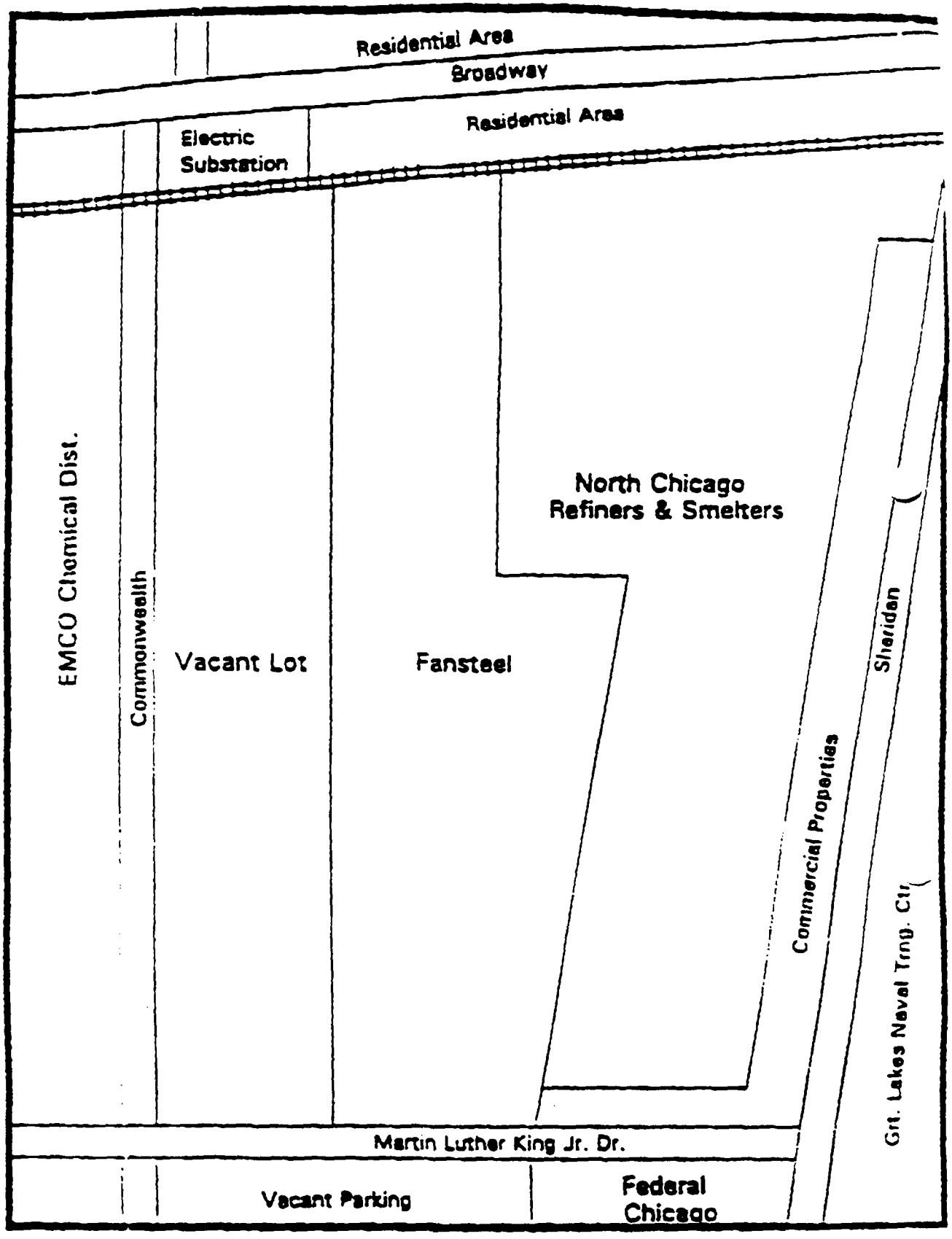
10. ATSDR Draft Update Toxicological Profile for Trichloroethylene. ATSDR, April 1993.

11. ATSDR Draft Update Toxicological Profile for Vinyl Chloride. ATSDR, April 1993.

Table 1. Maximum On- And Off-Site Contaminant Levels For Each Environmental Medium^

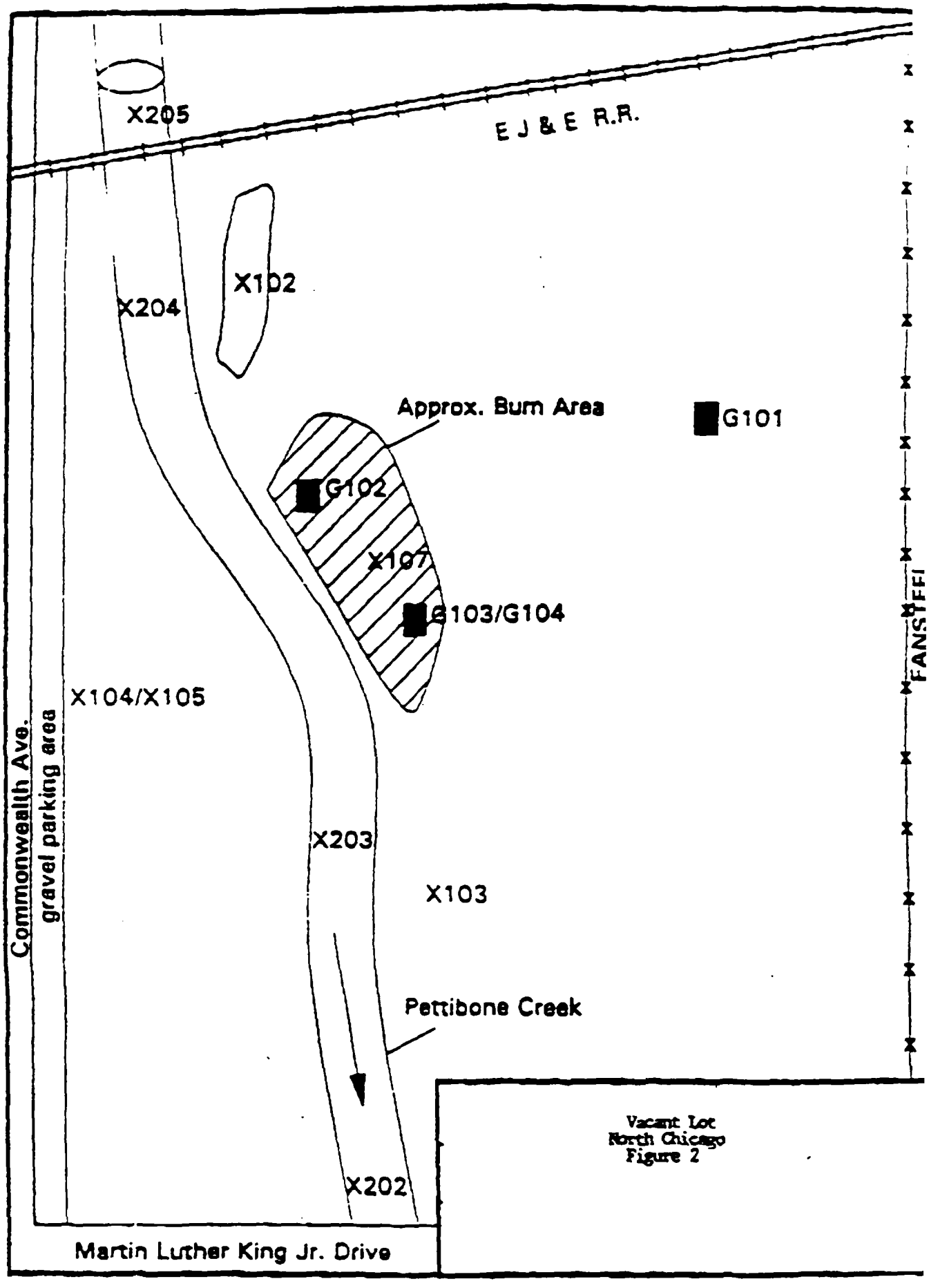
CONTAMINANT	SOIL/WASTE (ug/kg)	SEDIMENT (ug/kg)	GROUNDWATER (ug/L)
Acetone	19.0	2,200.0	ND
1,1-Dichloroethene	ND	3,000J	59.0
1,2-Dichloroethene	29.0	8,800.0	410.0J
1,1,1-Trichlorethane	ND	230.0	ND
2-Butanone	18.0	20.0	10.0J
Trichloroethene	440.0	550J	97.0
Tetrachloroethene	3.0J	11J	ND
Toluene	7.0J	10J	ND
Vinyl Chloride	ND	ND	2,800D
Phenanthrene	13,000.0	9,600.0	ND
Fluoranthene	16,000.0	14,000.0	ND
Pyrene	13,000.0	13,000.0	ND
Benzo(a)anthracene	7,700.0	7,500.0	ND
Chrysene	8,600.0	7,500.0	ND
Benzo(a)pyrene	7,900.0	8,200.0	ND
Aldrin	67.0	27.0	0.0041
Heptachlor Epoxide	7.8	2.0JP	ND
Dieldrin	38.0	26.0	ND
4,4'-DDE	1,800.0PCDJ	350.0	ND
Endrin	170.0	100.0P	ND
4,4'-DDT	1,400.0PCDJ	190	0.0056JP
Chlordane	25.0	30	0.003JP
PCBs (Total)	7,500PD	7,300PD	ND
Arsenic	29,000	22,000.0	ND
Beryllium	57,000	5,100.0	ND
Cadmium	21,700	3,300.0	16.4
Chromium	136,000	29,000.0	ND
Lead	12,800,000	1,410,000.0	6.1J
Manganese	3,190,000	506,000	1,050

^ - Three soil samples from 1988 site fire area not included
ND - Not detected
J - Estimated Value
C - Pesticide result, confirmed by GC/MS
D - Diluted Sample
P - Analysis by Inductively Coupled Plasma (ICP) Spectroscopy



Vacant Lot
North Chicago
Figure 1

Source: IEPA/CERCLA



Source: IEPA/CERCLA

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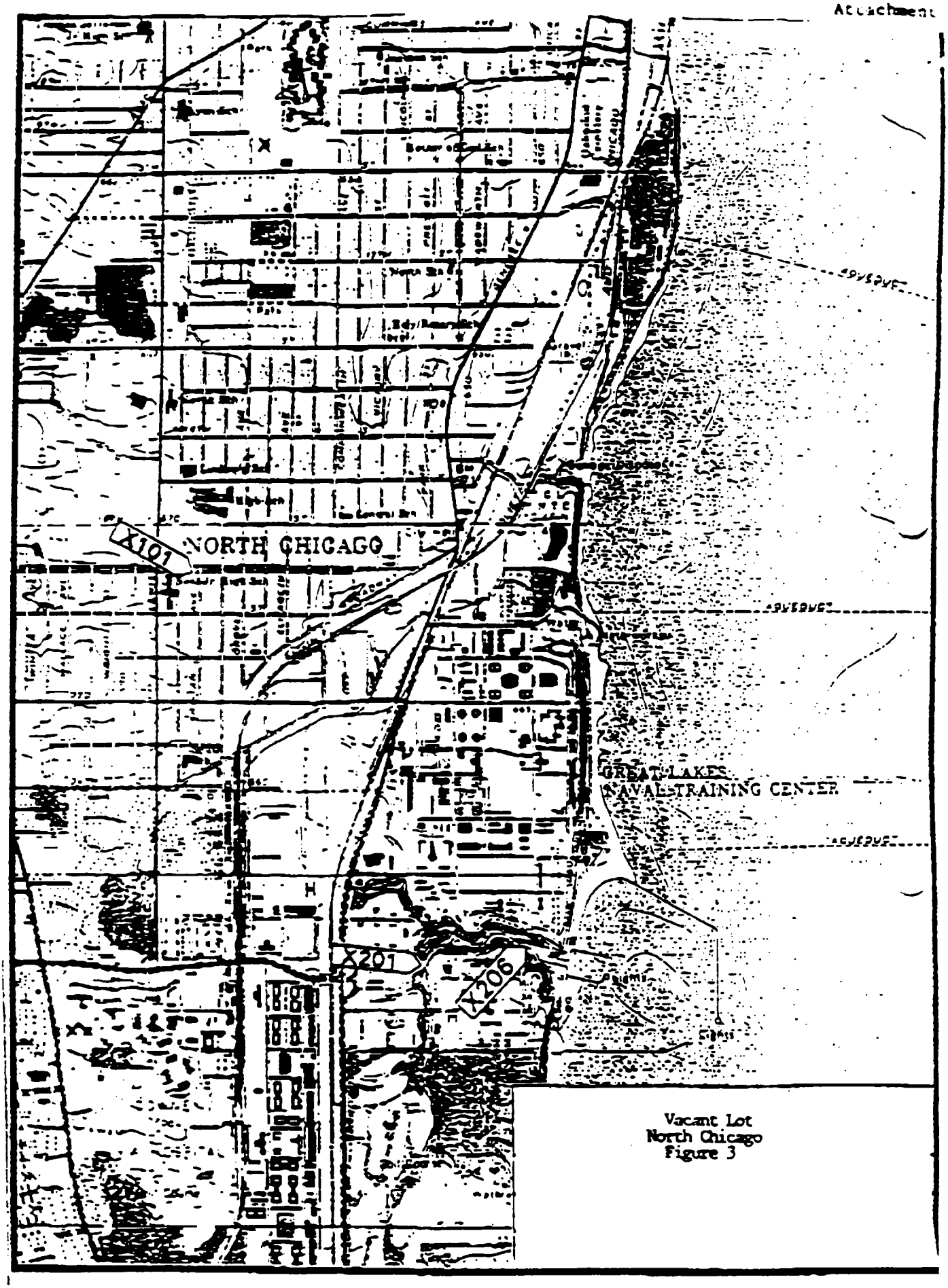
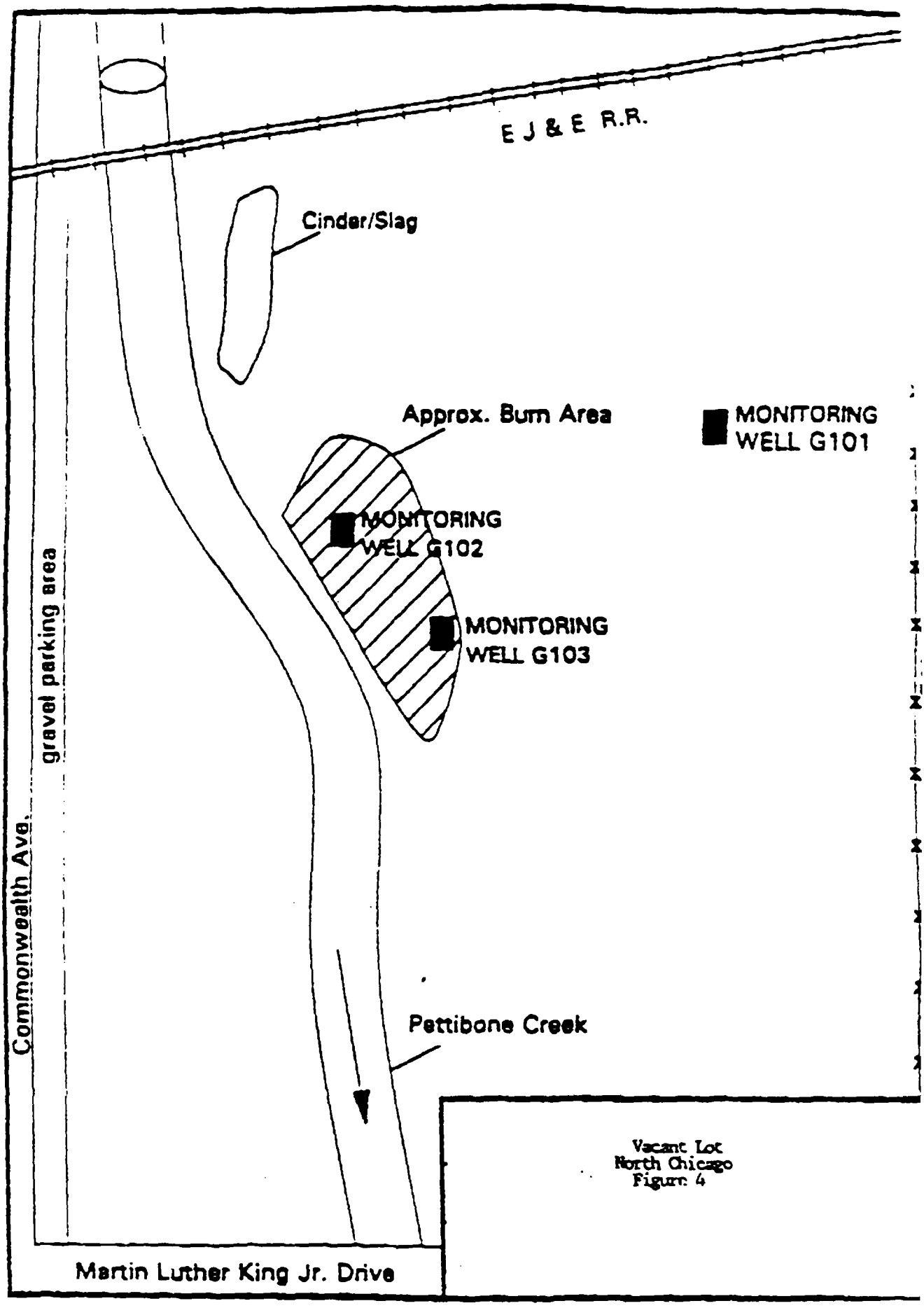


Source: IEPA/CERCLA
Site Assessment



Source: IEPA/CERCLA

CERTIFICATION

The Vacant Lot health consultation was prepared by the Illinois Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Technical Project Officer, SPS, SSAB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation, and concurs with its findings.

Chief, SSAB, DHAC, ATSDR